



## **The role of research and infrastructure in building a sustainable world.**

### **Plenary 1**

#### **Moderator:**

Elizabeth Cannon, President Emerita, University of Calgary

#### **Panelists:**

Dr. Edith Heard, Director General, European Molecular Biological Laboratory

Dr. Jan Hrušák, Chair, European Strategy Forum on Research Infrastructures

Dr. Youba Sokona, Vice Chair of the IPCC and former Executive Secretary of the Sahara and the Sahel Observatory

Moderator: Welcome, everyone. It's fantastic to have you here for this great panel on a really important topic. My name's Elizabeth Cannon. I'm President, Emerita, of the University of Calgary based here in Calgary, Alberta.

The topic of our session this morning is the role of research and infrastructure in building a sustainable world. We know that the last year has really been about global challenges with the pandemic, but we're seeing more global challenges emerging to ensure that we have a sustainable future, be it economic, environmental and social aspects of sustainability.

The role of research and research infrastructure in meeting these global challenges is paramount. We have a panel that is multidisciplinary to bring their views and to answer questions on this topic. And I know it will be extremely fruitful and stimulating.

I'm joined on the panel by Dr. Jan Hrušák, Chair, European Strategy Forum on Research Infrastructures; Dr. Edith Heard, Director General, European Molecular Biological Laboratory; and Dr. Youba Sokona, Vice Chair of the IPCC and former Executive Secretary of the Sahara and the Sahel Observatory. Welcome to our panelists, it's great to have you here this morning.

We're going to open up by each of our panelists giving us their views on the contribution of research infrastructure and fostering a more sustainable future.

We're going to start with Dr. Hrušák, followed by Dr. Heard and Dr. Sokona. So let's get started, after which we'll follow with some Q&A.

Over to you Dr. Hrušák. Welcome.



Dr. Jan Hrušák: Dear colleagues, it's my great pleasure to represent in this panel the European Strategy Forum on Research Infrastructures (ESFRI).

Since its establishment almost 20 years ago, ESFRI as an intergovernmental organization, advises the council of European research ministers and the European Commission on research infrastructure-related issues. The joint effort of the member states, the associated countries and the European Commission has radically transformed their landscape of research infrastructures in Europe and we proudly look back to 55 projects and landmarks on our roadmap. These research infrastructures of European relevance awards almost \$20 billion Euros joint investment and are serving research communities around the globe, while providing an effective mechanism to identify new investment priorities, ESFRI's ambition, goals well beyond coordinating those investments. So ESFRI wants to aim at policy advice in several areas, including sustainability of research infrastructures. We aim to contribute to further facilitate high quality cross-disciplinary research [00:03:35] of sustainability. We advocate data interoperability as an important instrument to tackle societal challenges and contribute to sustainability development goals. We are aiming at creating an interconnected research infrastructure ecosystem capable to respond to emerging threats globally and to strengthen the societal readiness and the resilience at large. We are fostering synergies between the different European national and other funding sources and related strategies to maximize the impact and global outreach of the research infrastructures. So ESFRI is a very policy-oriented gathering and very recently, we have assembled our strategic vision in a policy paper called Making Sense Happen, which sets a new perspective, new ambition for research infrastructures mainly in the European research area. However, this paper conveys so many messages that can be generalized and used by others around the globe and I would like to highlight only one.

The main message conveyed by this White Paper, which was developed well before COVID but proven to be right by the pandemic, is that a healthy, sustainable, interconnected, interoperable research infrastructure ecosystem that strives for scientific excellence with impact and increases the state of readiness is [00:05:27] for sustainable economic growth, for competitiveness of our economies, for regional development and broad societal welfare. This integrated research infrastructure ecosystem including proper governments and interoperability framework, is the best prevention for any future crisis scenarios.

This is from my side. Thank you.



Moderator: Thank you very much, Jan. Over to you, Dr. Heard.

Dr. Edith Heard: Thank you. Thank you so much. It's a real pleasure to be here today and I'd like to thank you, Elizabeth, for the introductions and for moderating this panel. And my thanks also to Innovation Canada and the EU Commission for organizing this great conference and for having me.

I'm really happy to be speaking at ICRI as the Director General of the European Molecular Biology Laboratory (EMBL) and I'd like to stress that this event is really a very important forum to discuss research infrastructure priorities. It's very timely as well because on the one hand, support for research infrastructures is not increasing as rapidly as we'd like to see but on the other hand, we really had to rely on them even more heavily than before, given this time of crisis.

I just want to say a few words about EMBL. This is Europe's only intergovernmental laboratory for the life sciences. We were established in 1974, and we're supported by over 27 member states and we're located at six sites across Europe in Barcelona, Cambridge, Grenoble, Hamburg and Rome with our headquarters here in Heidelberg.

Across our sites, our research spans all aspects of molecular biology, from structural biology and bioinformatics right through to neurobiology and disease modeling. Alongside our mission to perform high quality fundamental research, we also develop and offer vital services to scientists in our member states. We train scientists and students and visitors at all levels and we actively engage in innovation and translation, and also we provide an integrated approach to European life sciences.

I just want to say a word about our service mission because all of our sites have an important service role. EMBL provides structural biology infrastructure for biologists from all over Europe at the ESRF in Grenoble and at the Daisy Campus in Hamburg. We enable access to many of the most cutting-edge technologies via our experimental services and core facilities. And at EMBL-EBI, which is in Cambridge or near Cambridge, this hosts the world's largest biological data resources, making it freely and openly available to everyone. So these research infrastructures are an absolutely vital importance to the science research that we and other scientists around the world do and it's been particularly apparent during the pandemic, as we repurposed most of our facilities to contribute to the fight against this virus. And we also collaborated with the EU Commission to set up the COVID-19 data portal that in 2020, recorded over 3.6 million web requests by users from more than 175



geographical locations. So today's pandemic has really highlighted the need for long-term sustainable support to fundamental research, to open science and to research infrastructures that hosts scientists across Europe and around the world.

Fundamental science, with support from industry has been absolutely key to allowing the rapid development of vaccines and the therapeutics that we're using during this crisis. It's also our best line of defence for the challenges of the future, both known and unknown. And we know that there are going to be challenges tomorrow. Indeed, the pandemic has really brought home the need to understand life in all its forms, in order to protect not only our own health but that of our planet.

And so to rise up to these global challenges and to find new solutions, EMBL is launching a five-year plan called Molecules to Ecosystems, which starts in 2022 and where we're hoping to build up on our existing and globally recognized expertise in molecular biology and reach out to new scientific areas such as ecology, epidemiology, areas that are relevant to microbial and human ecosystems, as well as infection and what we call planetary biology. And in doing this, EMBL will prevent or prepare to fight global challenges at the molecular level. And just to illustrate this very briefly with four practical examples.

Climate change: Researching ecosystems at the molecular level can really help to develop and scale-up carbon fixation solutions and work is already ongoing at EMBL to understand natural ways of fixing carbon using algae, for example, that we can already find in our oceans.

The second example is biodiversity. Researching whole animals can actually guide the solutions to reverse the impact of biodiversity collapse that we're seeing. EMBL is actually looking into how marine animals such as sea anemones are actually affected by physical environmental changes and what happens when those environments are disturbed mainly by man.

Disease: Most disease is dependent on the environment. So to research cancer, infection and micro biomes, we're actually looking into what happens in bodies using models but also using human datasets, where we're exposed to different environmental insults, or the impact that some of the drugs that we take can have. So it's only through an advancement of this kind of understanding that we can actually move towards personalized medicine and data driven solutions. And EMBL really hopes to improve the diagnoses and develop better therapies that build on a rich body of ongoing work.



Last but not least, antimicrobial resistance. EMBL scientists are trying to develop new strategies to combat the spread of multidrug-resistant pathogens that we're facing. This is going to be the next killer. In 10 or 20 years from now, we will no longer be able to treat pathogens that hit us, and there are fewer and fewer antibiotics being developed by companies so we need to come up with solutions that prevent this spread.

In preparing to launch this new program, we also recognized that EMBL, like all large research institutions, has three key responsibilities when it comes to sustainability.

First, we have to perform research in an environmentally responsible way.

Second, we can do research that is relevant to the issues that are facing us while still being fundamental. We have a duty to do this.

Third, we have to speak up and promote sustainable science.

And so to these ends, we're developing an environmental sustainability strategy which will aim to drive down our carbon footprint, reduce the waste we generate and ensure that the research that we do in these areas is actually supported. And we want to share our journey and encourage others to join us. We need to lead by example, not just through the research that we do but also the way we do it, our practices.

In conclusion, research infrastructures such as EMBL and the experimental and data services that we provide, fuel a virtuous cycle of research, service and technology development, and we also bring together scientific expertise across disciplines that really drive the way to discoveries that we need to address both current and future challenges. Research infrastructures are the drivers of innovation. They help to develop the most advanced instruments in cutting edge technologies, often in close collaboration with industry. And I really want to insist on the fact that it's through collaboration between established organizations that we can really ensure open science and that that becomes the new normal.

And, last but not least, our community trains and nurtures the next generation of scientists, who of course, are the most critical seeds of future success. Without them, there can be no future.

So with all of this in mind, I really look forward to the panel discussion and I thank you so much for your attention.



Moderator: Thank you very much, Edith and over to you, Dr. Sokona.

Dr. Youba Sokona: Thank you. I'm delighted and I'm honoured to be part of this conversation on a very important issue and topic in this pandemic situation.

I think that the best way to very well understand and then to see how to deal with that issue is to look at the IPCC what they ended up on pandemic change is doing because IPCC is dealing with climate change to a global problem and that requires science, it also requires a global participation. It's a global common goods issue.

IPCC, as it has been totally setup, has to assess on a comprehensive objective and often on transparent basis, the scientific, technical, socio-economic and all information related to understanding the scientific basis for climate risk of human [00:14:43] and on climate change that is a potential impact and option to adapt and to mitigate on the pandemic change aspect and it has to be done in a much more transparent basis and then without any policy considerations. It has to be neutral and even if the product of IPCC informing the policy. This is very important to understand.

And in each of the IPCC reports, since it has been set up abreast different issues inform policy aspects related to sustainability. The first report of IPCC has been instrumental to the establishment of the United Nations Convention on Climate Change.

The second report of IPCC clearly led to the Kyoto protocol that was an instrument of the climate convention in a continuous basis and then more science came in.

The third assessment of IPCC also led to the issue of adaptation because in the beginning, the discussion was around mitigation and then adaptation became prominent through the thorough assessment report of IPCC.

And then the whole issue of the two degree threshold came up from the IPCC Fourth Assessment report and the Paris Agreement, and then this Fifth Assessment report of IPCC has been thoroughly instrumental for that. And the Sixth Assessment report, is expecting to provide input to the global stock take so that you can see the process.

While IPCC is not conducting research, it stimulates research because it's assessing peer review literature that came from the research. At the same time, non-peer review literature also because we have to bring in different perspectives, but there is some conditions on how to bring in and then all kind

of knowledge. It's important to understand that since the IPCC has been set up, it stimulated an exponential production of knowledge related to a better understanding of the climate system, the climate issues, in connection to the sustainability because it all has been in the centre of development context. That is the extreme activities.

Recently, we had been asked just after the Paris Convention, IPCC, to undertake a report on 1.5 [00:17:27]. We said, "Oh, how can we do that?" Is it [00:17:33 *possible*]? Do we have enough literature to assess because our duty is to assess literature? And we assessed within a very limited amount of time, two years term, 6,000 publications on the issue.

In the beginning of the IPCC, globally we had around 10,000 scientific publications on different aspects. Actually, some people are thinking about something between 300,000 to 500,000 publications. And it is very important, that's how it has stimulated the research on the virus aspect. And if we look at also on the composition of the IPCC, it was dominated by the scientists and then the [00:18:19] came in from the North. Actually, all parts of the world, including Africa, Latin America, and Asia are part of the process, an open process. This is not also a closed group that's very important and it also acts as the inter linkage between the policy and science because it's not research for research, it's to research to inform policy at various levels and that seems to me, very important. It's very important also that in each of the assessment of IPCC reports, it indicates the knowledge gap: What do we know? What we don't know and then how to bring those different elements. Maybe it might be important then to see how it will on the [00:19:08] activities where the research has to be done and then to see what kind of infrastructure is needed and then to bring that and then also on the downstream activities.

One of the important elements also of IPCC to make it more transparent, to make it highly policy relevant, is that it's based on the work of thousands of scientists who do it on a voluntary basis. They're not paid to do this. And it's important also to understand that and then to bring a sustainability element and aspect on it, the concept is co-conceived and then all the work of IPCC is co-conceived with the government, with the policy makers, different stakeholders. And then that being the scoping of each of the reports is done jointly with government and the other stakeholders and then to agree on the outline of things that need to be done.

And then in the report of the IPCC, particularly the summary for the policy makers, is co-produced by the government because it's discussed line by line with the scientists and the government and then to have a better





understanding and then do the report, [00:20:23] in making that co-production, it's made up of the underlying report, 500 pages, because nothing can be part of the [00:20:35] that is not in the main report and then those are different elements. The co-consumption in the beginning defining the scope of the report and then the summary for the policy makers that has been conceived by the government how you can see how it has been defined and then that is clearly informing the ambition of [00:20:57 *a risk event*] that is the research and then how to bring in sustainability context.

And those are some of the elements I just wanted to bring to your attention in order to stimulate the discussion. I can go through some of the details in the Q&A questions.

Thank you.

Moderator: Thank you very much, Youba—fantastic opening remarks from our panelists.

I'd like to get into a little bit of Q&A. First one is going to be directed to you, Edith and then follow-up from Youba and Jan. But you've lived through the pandemic in terms of trying to harness sort of the science capacity to tackle things like vaccines and it just reminds us that global challenges and crises do not respect national borders. The question is: How do we ensure that, whether it's national or jointly funded research and research infrastructure is brought to bear, is brought online to address these global challenges and maybe give us a little bit more insight into how you, in a very nimble way, were able to shift the emphasis within some of your infrastructure, some of your research programs to really target at something that had a lot of immediate urgency around the pandemic?

Dr. Edith Heard: Well thank you for that question, I think indeed, it's very timely.

For me, the first point that needs to be made here is that we absolutely need to ensure that scientific research and research infrastructures are properly funded and reported on an ongoing basis and not just activated in times of crisis.

Our COVID-19 data portal, which was the basis of the European COVID-19 platform, was something that we had already established for other purposes and it's because we had the support to do that in a sustainable way that we were able to immediately transform it and activate it. Even in January 2019, we were ready to go. And I think this really highlights how if we hadn't had that, we would have been in a very difficult position because we need the sharing of data, we needed the open science aspect of it, we needed the





bioinformatics. Now we have genomics, we can really follow what's happening with these viruses and also how people are affected. If we didn't have that, we would have been, I would say, almost in the Middle Ages just watching it as it happened and not really understanding what's going on. That requires believing in investment before the time comes to activate. And I really think that this is what we should be thinking about across the board.

For example, in our new program, we want to ask for support to, for example, have mobile labs so that we can really combine our research and services and take the laboratories where they're needed. If the next challenge is going to be of a slightly different nature, we need to go out in the field perhaps, to actually address this. But for that, we need the sustained support in order to do it. And some of the tools that EMBL developed 30 years ago are now being used against this particular pandemic, the cryo-EM sort of approaches that people are using to design where the vaccine should be targeted. The vaccines themselves are being tested on some of our synchrotrons. If we hadn't had all that up and running, we never would have been able to react in the way we did. And although everyone's complaining about how slow everything is, actually, frankly, it's amazing that we have vaccines that work in such a short time and that's because of the past investments into infrastructures and research.

Moderator: Thank you, Edith.

Over to you, Youba, maybe carrying on in that thought from a policy perspective and climate change is clearly an issue, a global challenge. It's in front of us, perhaps is not seen—I won't say it isn't, but it's not seen—perhaps it's having the same level of urgency with respect to a pandemic but nonetheless, the importance of really enabling and bringing to bear research and research infrastructure to tackle things like climate change. Could you maybe speak from your experience at IPCC, how that can be done to tackle something like climate change?

Dr. Youba Sokona: I think that area indicated one key element and that is funding and this is a crucial problem. And then the climate change or pandemic and we see as an important issue for Africa. And I had experience on that because I was the inaugural director of the African Climate Policy Centre (ACPC). And then to put in place research infrastructure to inform policies on climate, one of the biggest problems is related to how to get financing. And that also in the IPCC, is a critical element because we do have limited scientists from Africa in the IPCC because they are not receiving any support from the government and then there are limited resources to put on research. To some extent, this is

understandable because the government is confronted with multiple emergencies, everything is urgent. Everything is urgent and then they feel that investing in research is that, so the payback of investing in research is too long and they cannot wait, they have to look at the emergencies. And this is one of the biggest problems, dilemmas we are facing. And at the same time, we have to find the ways of being a part of a number of networks and then to bring some of the perspectives, some of the issues that are very important because as it had been stated in the [00:27:07 *Concept North*] of this event and that is no single country can provide a solution to the problem and then we have to do it collectively. It's a collective effort. And then we will need in that perspective to think about one important element that is emerging in a discussion and that is solidarity. It is not a corporation. It is not a kind of to give charity because we are in the same boat and then we have to move together. And then we have to think together, we have to act together. We cannot act passionately, that's a direct subject. Climate's related to pandemic, you cannot isolate Europe, or isolate North America, or isolate Africa to [00:27:52 *deal with that issue*]. We may, to a certain limited number of time, deal with a problem in one part of world. We cannot globally solve the problem. All the emerging global issues are collective and then we need really, to think through what the real meaning of solidarity is, and then how to make it practical and then how to go beyond the kind of classical way of dealing with the relationship between countries, relationship between North and South and then to take collectively our common challenges and then to find best solutions for the future of humanity.

Moderator: Thank you.

Jan, did you want to add to that?

Dr. Jan Hrušák: Yes, thank you Elizabeth. I resonate largely with both panelists and somehow proudly, I can say that ESFRI develops already 20 years in a very similar spirit. So the idea I have been mentioning in the beginning, namely this integrated healthy ecosystem of research infrastructures, which in some extent builds on the capacity of individual research infrastructures but integrates that, interconnects that in many directions and prepares. So we are somehow developing a state of readiness which allows us to fast react on upcoming emergencies, and the COVID situation has shown that research infrastructures indeed have a huge capacity. And since very early, the beginning of the pandemic, we saw huge mobilization of research infrastructure resources and those have not been conserved only in life sciences but actions we have taken across all scientific disciplines and this

interconnected network of research infrastructure, the research infrastructure clusters, their existence allowed really fast reactions and there were mechanisms in place almost immediately like fast-track access pathways to research infrastructures, like development of mechanisms to share specific data on COVID, or other measures taken in physical sciences or humanities that have developing technologies to battle COVID. So this is an example which shows that we really need this system which spreads all over scientific disciplines because probably the next crisis will not be a virus crisis. Eventually there'll not even be an environmental crisis. It may come from an entirely different direction and we have to be equipped to react fast at a very broad scale. So the coordination we are doing, the strategic planning we are doing in ESFRI, the policy discussions we are doing among the member states, the European Commission, the involvement of stakeholders, the involvement of research infrastructure in those discussions, seems to be very critical to increase our resilience.

Moderator: Thank you, Jan.

Youba, I'm going to ask you, too, for the next question and really, it's about society's confidence in science. And for all of these global challenges, those that we've seen, those that are to come, as Jan has indicated, it's very important that society is comfortable and confident in the science and scientists and we've seen that in the pandemic of the critical role it plays. How do we ensure that science is promoted and supported to get funding, to believe in the impact of science, to solve some of this beyond a time of crisis? So the concept of science promotion, I think many scientists aren't necessarily so comfortable with promotion, but it's absolutely key to have that support from our community and most crucially, the support from funders.

Dr. Youba Sokona: This has been one of the critical issues for the 30 years of existence of climate convention we are fighting for. And you will see different mechanisms related to climate funding from the Global Environmental Facility to the specific fund of climate on adaptation, on LDC Fund, on now the Global Climate Fund, the GCF. But none of that funding is addressing research, that's a big problem. And that they only focus on actions, on activities not that research is conceived as one of the critical fundamental aspects because we all know unless we have clarity on the science, action cannot be achieved, the ultimate objective for which we will be taking them.

I remember back to the early days of the climate change convention. When the GF started, they wanted to have a number of programs in Africa. I said, "No. You cannot have the project on climate mitigation; you need to be



capacity first and the capacity based on the science, on the research.” And we said that we need to start mobilizing capacity first and building capacity in order to better understand and then to come up with how you articulate the development need of the country with the climate aspect. And then unless you have a good research knowledge-based system, you cannot do that. And when I say that capacity issue, is it that one of the projects for one to two years, its ongoing activities because it’s learning by doing. And then they start it and then immediately they stopped. One of the first projects in Africa on climate I was conducting that was capacity building and then to take different universities in four African countries, they stopped and then they changed it as an enabling activity. That meant everything [we had] that we now have nothing. You run the washer, it’s enabling activity. It’s completely different [00:34:54]. And if you look at the point of view, actually, of the GCF or any bilateral, you will hardly, hardly see anything related to the science, the production of the knowledge. And in all of them, they know that we are lacking, there is a huge role of gap on a number of issues and on that also emerged with the whole issue of the pandemic. And then we look at the society in the North, what are their roles of confinement, their social distancing and all that. That will not work in Africa. Even if you take India, it cannot work in New Deli, the nice part of Deli. The old Deli, it will never work because of how people are the interconnection, the social issues. We need to understand that. And then how you can [00:35:50] rules if you do not understand the different pathways. And then those are some of the things we need to have at play at the global and bilateral level and then to support science and research in order to better inform policies.

Moderator: Thank you.

Edith, you’re living and breathing this every day, could you maybe give us your thoughts?

Dr. Edith Heard: I completely agree with what Youba said. I think for us, what’s obvious, is that we have to make sure that science becomes a priority for society at large. And for that, national governments, if they know that, they will make sure it’s properly funded. So it’s this knowledge-based world that we would all like to strive for, it’s up to us as citizens. And scientists, I feel, we don’t always do the best job in presenting what we do, our research and its importance in a way that’s comprehensible. We need to make, obviously, politicians aware but we need everyone to be aware and to care. So it really is a dialogue that we need to invest in. And it’s not just about the journalists either. Obviously, journalists are there to sort of transmit information, but it’s up to us, all of us, to try and

make sure that this will work. I think this is the virtuous circle that at EMBL we're trying to complete and I want to give you one example of something that really worked.

EMBL has collaborated with this research vessel, this boat called Tara. I don't know if you've ever heard of Tara Oceans? It was a wonderful project, where it's a tiny little sailing boat, went round the world to sample the world's oceans to look at biodiversity in a very kind of systematic way and we were actually part of it right from the beginning. And last year, or a couple of years ago, we did a microplastics tour in 2019 with them. And every time the boat stopped off, it would spend the morning hosting school kids, teachers', showing what science is about and it was systematic. It wasn't, "Oh, well, today we're going to do it." Every day, whenever they were in port, that's what they would do. And in a way, I think that's what we should all do. And we really have to make the effort, it's not easy to sort of get away from what our particular mission is in molecular biology, running a synchrotron, whatever, we've got to reach out to citizens. So I think citizen science and reaching out to society is going to be key if we want to change things and we have to change fast, as I think, Elizabeth, you said, climate change is creeping up on us. We don't see it when it's happening. And unless people become aware and we help them realize it, there are solutions. With science, we can find solutions before it's too late. Look at acid rain, look at the ozone hole. So we need to do this in a very, very practical way and we have the tools now. Things like internet, we really can communicate across the world. And I think that, for me, is where EMBL is trying to act, to try and connect up to society in the most proactive way we can.

Moderator: Jan, maybe you could respond and also bridge into our next question, which is really going back to where we started. We can't do this alone. It is about promoting science, about doing science and taking an international approach. And if you could maybe speak to that, the benefits of international. I know you're working within Europe and then Europe is connected to the broader world. So if you could give us your thoughts, please.

Dr. Jan Hrušák: Thank you, Elizabeth.

First, let me just narrow down the previous question to the perspective of research infrastructures because I think there is a very important element to be mentioned, namely research infrastructures. Their distinct strengths are that those research infrastructures are natural meeting points, are meeting points where diverse scientific communities jointly develop and understand scientific issues, verify scientific theories. These are meeting points where

basic science is challenging technologies and technical development. These are meeting points where scientific discoveries are transformed into innovation. Those are meeting points where transversal communication creates new cultural dialogue platforms, networking opportunities including communication with the society. The capacity to respond to these complex issues as we are speaking about and being in the COVID pandemic, or issues related to environment, earthquakes, ozone holes and so on, require that this communication takes place at a very broad scale because it requires not only transdisciplinary communication among the scientists that gives [00:41:04 *impotence*] to novel ideas and probably over populates the environment to develop science-based solutions to these societal needs and challenges, but it also needs the communication with the society to increase the acceptance, to increase the pressure for solving these issues because it costs money and I mean it's public money after all. So the decisions are taken at the policy-political level and social understanding, social support, social pressure even helps a lot to bring these important issues to the horizon and I think research infrastructure should also have a role here to play.

And to the international corporations, I mean surely we are in a situation where we, in Europe, build with ESFRI and with other initiatives with the [00:42:09] regulation and so on, we build in to the research infrastructures already a piece of international environment, being only the European one. And now the last years, we are trying to extend and let the infrastructures operate in open modes internationally or even globally to network with partners in other parts of the world, to create mechanisms for funding and supporting access to European infrastructures, to develop skills how to better align, how to make the services of research infrastructures globally more efficient, effective in a synergic manner. Yes, this is true. On the other hand, we are still in very early beginnings because this entire endeavour must be projected to some governance models and again, we are here with funding. We are here with sharing the cost, sharing responsibilities, sharing the workload, sharing all these issues and there, the models are really just being developed. So to extend the open science concept, to the data sharing concept, the concept of open access to research infrastructure globally will still require some work, but I believe that we already understand the problem and so we are moving closer to a solution.

Moderator: Thank you. I wanted to continue on the vein of international cooperation and I'm going to turn it to you, Youba but from a slightly different lens and that is from the disparity in access and availability of research infrastructure, state-of-the-art infrastructure between developing and developed countries. What do



you think can be done to help address this particular issue and building that international cooperation and more equitable access to state-of-the-art infrastructure?

Dr. Youba Sokona: I think that we already do have the experience on that and that worked really well but that will require, as I indicated, to have a clear understanding of what solidarity means and then to also have a minimum of humility.

Back to the '80s, after the second oil shock, the European Union decided and then to sync energy policy for Europe how to be independent from the oil imports. And there were some likeminded people at that time at the European Commission and then they said, "Oh, for us in order to think how Europe can be independent, how Europe can articulate [00:45:24] policy, we have to have developed in terms of actually their own energy policy in their own perspective." And we set up a network called Co-operative Program on Energy and Development with different universities and think tanks from the South and the think tank universities in Europe. It was [00:45:47] Rio de Janeiro; [00:45:50] Mexico; [00:45:51 *Bellucci*] Foundation Argentina; TERI in India; [00:45:55] in China; [00:45:56 *Enda*] in Senegal; in Africa, University of Dar es Salaam; SPRU in Brighton; and [00:46:01].

Each year, we define what we think are the most important issues independently. It is not the think tank, the university of the North who will think through. And then we'll look at the same issue differently from our own perspective. The European [00:46:20] will look at the European perspective; the African, the African perspective; the Latin American, the Latin American perspective; and the [00:46:25 *Asian, the Asian*] perspective and it'll put that together. And then from five years, we come up with trending thousands of people on energy planning in Africa, and then the first energy balance of Africa has been set off through that process and in the training also for energy policy and energy planning and then we even connect with the World Bank who have the energy policy framework [00:46:50] for Africa and then those kinds of things we need to stimulate them and then to bring them. We do have experience on that, dealing with the common problem, the common issues and then we all need to set the agenda of what research needs to be done. We all need to conduct jointly, collectively from our own perspectives, and then the way you would define the energy transition in Europe and the way you would define the energy transition in Africa is completely different. I have not seen currently in any of the discussions of energy transition phasing out charcoal and firewood in Africa by 2030 and this is a fundamental critical health issue, fundamental critical climate issue, fundamental critical





development issue and then this is one of the key elements that should be at the heart of the energy transition in Africa. And then those will never transpire if some will think for the African but the point is that means to have the solidarity and then to bring the resources, we cannot also ask the African government that are dealing with thousands of emergencies and then to put some resources on the research side.

Moderator: Thank you.

Edith, over to you in terms of maybe examples of international collaboration beyond Europe or with developing countries, could you perhaps highlight some work that you're doing?

Dr. Edith Heard: Absolutely and I just want to say, first of all, as scientists working with research infrastructures, science should have no frontiers and science should be global. And today, we really can be global. For example, from EMBL's perspective, the infrastructures and the technologies that we have, we want to be able to share. So this idea of having mobile labs where we take the infrastructure to the country that needs it, is very much part of that philosophy. Things are becoming easier and easier, cheaper and cheaper and we need to share with the entire world, the tools that we have. Whether it's going out and sequencing the genomes wherever you are, it's becoming much easier. So this is something I feel very passionate about and actually I'm in the scientific council of the World Health Organization and this is exactly the sort of thing that we're talking about, how could we do this in a global way?

Youba, you're perfectly right, Europe finds its solutions. Well I think that Europe has done not too badly. Horizon 2020 was a wonderful widening program with its twinning and teaming actions that allowed some of the member states who actually really didn't have the access that they could and they used these tools to actually build up strengths and we've seen this even in a few years how quickly a country can sort of take off because of these twinning and teaming's between different countries and this is what we need to do to other parts of the world. And EMBL, we're part of, for example, a consortium called Cabana, which together with nine Latin American organizations, has the goal to strengthen bioinformatics capacity across Latin America through open data sharing. So the Cabana project actually aims to tackle three global challenges. One is communicable disease, the other is sustainable food production and the third is protection by diversity. So this is something that we can now easily with Latin America and this is, I think, what we should try to do across the world. And I do look forward to being able to



work with all continents because I truly believe that science should have no frontiers.

Moderator: Thank you.

Jan, over to you for a final comment before we open it up to questions from our participants.

Dr. Jan Hrušák: Thank you. I will be very brief because I essentially agree with what was said by Edith and just slightly expanding on that and trying to make a bridge back to the point where the discussion started.

Of course, we have many initiatives which try to involve and engage with scientists from all over the world. We are arguing that science has no frontiers, that best let's say research shall find the place and a better research project shall be supported irrespectively from the region they come from. But on the other hand, research infrastructures as physical installations have, of course also the regional dimension and they have impacts in a very small perimeter where they are placed. So one has to ensure a balance between scientific excellent we are speaking about and the territorial cohesion. This is now done throughout Europe. We are using European regional development funds to build research infrastructures in less performing regions and this seems to be a big success, in particular because of the access to research infrastructures is now possible also in a remote way. We are also trying to extend this concept globally and some of the research infrastructure, some of the European research infrastructures are in remote areas in South Africa, in Australia, the telescopes in Chile and so on. But again, this concept requires a lot of policy considerations, but it seems to work and we shall definitely expand on that.

Moderator: Thank you very much, Jan and thank you to our panelists for the first part of the Q&A. And we're going to move to Q&A from our participants, so thank you very much and on to the next section.

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Moderator: I'd like to welcome all our delegates to pose some questions to our panelists. You see the Q&A function within the platform so please go ahead, any questions to our panelists. We have about 10, 12 minutes left for Q&A, so please ask some questions.

And while we're waiting for that, I want to go back to something that each of you addressed in your remarks, and you've kind of woven it through all of your



responses, and that is research data as part of the research infrastructure landscape and how important that is. We often think of infrastructure as physical equipment and facilities, but the data really underpins a lot of the research that we're looking at in terms of tackling these grand challenges.

Edith, to you maybe to speak of what are some of those barriers perhaps, and opportunities to access and usage of research data, particularly across jurisdictions.

Dr. Edith Heard: Thank you, that's a really important question and once more, I think the pandemic has raised how critical it is to not just generate data fast and well but to share it. And so this concept of open science and making sure that all of the right people manage to get hold of the data and make sense of it, is really at the heart of what science and research infrastructures are about. So I do think it is a challenge because every region of the world has different challenges, different jurisdictions and we really need to find ways of swiftly sharing data between regions the pandemic has shown it but also just for the advancement of science and knowledge. I think the key is to try and use international organizations to try and help weld together these concepts of sharing data. For example, we're in discussions with UNESCO, where clearly it's very important to try and see how to deal with the pandemic approaches. But I also wanted to just say that as EMBL is part of IRA forum, which is a forum of research infrastructures. This is something that every kind of research infrastructure has to think about.

The IRA forum also concerns CERN, the ESRF, the ILL, the ESA, ESO, EXFIL and basically, huge amounts of data are generated and have to be made sense of. In fact, we've decided this year to set up a big symposium that's called Grand Challenges in Artificial Intelligence and Data Science. And I think that if we could think globally to use or to best exploit artificial intelligence, you need an awful lot of data and you need to be able to deal with it in a sensible way. And we're there. I think at the global level we can do it. And even for those parts of the world where there are fewer resources, we can surely try and make sure that the big data that's being generated on many different fronts, and not just in the life sciences but in physics and other areas, can truly be shared and made use of. So, I think we have the tools, it's just about making sure the communities and the governments agree to make this happen.

Moderator: Thank you very much.



Maybe Youba, your thoughts on data as part of the research infrastructure landscape.

Dr. Youba Sokona: I think this is a fundamental crucial issue. None of the funding organization institutions are now willing to provide the resources for data. I'm currently working on a paper and to look at the Nexus climate conflict, the natural resource nexus. Fundamentally, this is based on the time series data in order to do an analysis.

In the context of Mali, one of the first partial monitoring on natural resources in Mali was done back in '83. Since then, nothing has been done. Only ad hoc basis from different projects here and there, not a continuous basis. I do not see any institutions that are willing to provide time series data. They want analysis and then they don't want to support data. They think that this is wasting money. And I think that we need to address that issue at the funding aspect as important as analytical work that needs to be done

Moderator: Thank you very much.

Jan, your thoughts.

Dr. Jan Hrušák: Thank you, Elizabeth.

The issue is incredibly complex and I can just agree with what was said by Edith and by Youba, and maybe just fulfilling my role and address the issue from the policy perspective. So to say the main asset we all have, in particular, in discussion with research infrastructures for which research data and sharing of research data is a very important element. And coming back to my mantra on this, interconnected research infrastructure ecosystem, research data are the glue that allows this interoperability of research infrastructures that allow us to tackle the issues which are raising and gaining on complexity. So we have really to move this open concept, this sharing of knowledge Europe-wide and globally from the policy perspective, from the policy concept to daily life and then we have to find the mean how to do that best.

One element which is for me, very, very important when discussing that at the European level where we are now trying to implement a very, very important tool that probably will also extend globally which is the European open science cloud as an instrument for data sharing, for data managing for the data interoperability, is the element of data quality because it doesn't make much sense to share all data without somehow considering which data is worth it to be widely distributed and hereby research infrastructures are and have an indispensable role because they are able to produce quality certified data and



provide them globally. So from the policy perspective, I think it is utterly most important that we not only recognize that sharing of research data is of vital importance for human beings that there are still some elements which must be incorporated in the concept quality is certainly one of them.

Moderator: Thank you very much, Jan.

We've had a few questions, thank you very much to our delegates. We've got three and so we've got time enough, I think, for brief answers to each one of them. And I'm going to ask the first one to you, Youba; the second one to Jan; and the third to Edith.

To you, Youba, a great question, and I'll summarize just given these societal implications of science locally and globally, how can research infrastructure better involve social scientists and humanities scholars as well as journalists in really bridging the gap between the science discoveries and the public interests on the other hand? So really involving our colleagues in social sciences, humanities, as well as journalists.

Dr. Youba Sokona: I think this is also a critical issue because in particular, on the climate side, more and more, we are trying to bring social scientists on board because they have been a bit aside, because they know their society, they know societal issues and then they know what the critical developmental elements are we need to look at with care. And it's important also that we educate journalists because you will find specialized journalism in many contexts of the North.

In the South, there are very limited journalists that are specialized and that can understand science and then how it's possible to translate science in a common language that is understandable by the general public. We see in the pandemic, all kinds of stories in the media and a lot of them are fake news and then that's also related to how it might be possible and to then to get that and to educate, this is very important. And then to have outreach programs with the key scientific issues, in order to be able to translate to an understandable language in the general public and particularly at the policy making level and different levels.

Moderator: Thank you very much, Youba.

Jan, a question on specific mechanisms that can be used to assure regional representation and geographical distribution of research infrastructures.



Dr. Jan Hrušák: This is certainly one of those questions that are very, very difficult to tackle because they are terribly dependent on the local environment. But generally speaking, if we sufficiently, clearly promote the idea that research infrastructures despite their impact on excellent science and the global outreach to research communities are strongly rooted in the region and that they critically influence the regional development at a very broad scale. I mean you are even changing the perception of education when you're placing research infrastructure to a neighbourhood which was originally a bit less developed. So when you are able to pass these messages to local and regional politicians, then there are certainly means how to support this transition.

In Europe, we are in a very comfortable situation because we have several instruments to support research, to research support, to innovation. We have several financial instruments called Regional Development Funds and others and these financial tools are proven to be very efficient when used to close the innovation gap, the gap in scientific excellence and probably, one could extend such schemes also globally and develop financial mechanisms that would support a broad spreading of research infrastructures, and harvesting all the benefits which occur not only at the global scale but also regionally when a scientific infrastructure is installed in a region.

I know I have not answered the question, but this would probably require an additional conference.

Moderator: Thank you, Jan.

Edith, I'm going to turn to you and ask you a question that I know you cannot answer in one minute which is all we have, but I think it'll be a topic that I'm sure will be woven through perhaps other conversations during the conference. And the theme is international cooperation and collaboration on research through research infrastructure. However, what we're seeing is, in some countries, in fact many countries, restrictions are starting to be imposed on public research activities citing national security precautions. What can the scientific community do to respond effectively and quickly to this, realizing that international collaboration is foundational to these global challenges? Just maybe a teaser answer from you.

Dr. Edith Heard: Well I think, indeed, the onus is on us and maybe research infrastructures in particular, to rise up to this challenge. We have tools. You know science without frontiers is one thing, but we have ways of communicating together. We can do remote science. The pandemic has shown us we don't even have



to be on site to be able to do science and share samples. So I think it's up to us to rise up to this challenge as a community and in a way, research infrastructures are the perfect tool for that, so up to us to get together and make sure that the public realizes that you cannot put science at stake like this.

Moderator: Thank you very much, Edith.

That brings our panel to a close. I want to thank our panelists, very rich discussion. Thank you so much for your insights and experience. Thank you to our delegates for attending and posing some great questions. I also want to mention to our delegates that you have a few minutes to back to the program agenda and to look at the links for the first set of parallel sessions. So again, thank you very much. I hope this provides lots of food for thought through the other sessions. Thank you to the ICRI organizers and sponsors.

Thank you.